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**A contribution to the Agathidinae, Alysiinae, Aphidiinae,  
Braconinae, Microgastrinae and Opiinae  
(Hymenoptera: Braconidae) from cotton fields and surrounding  
grasslands of Iran**

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**Abstract:** The braconid wasps (Hymenoptera: Braconidae) are powerful parasitoids of agricultural insect pests in almost all agroecosystems. The diversity of these natural enemies was studied in some cotton fields and surrounding grasslands of Iran. In a total of 44 species from 21 genera and six subfamilies (Agathidinae, Alysiinae, Aphidiinae, Braconinae, Microgastrinae, Opiinae) were collected.

**Key words:** Hymenoptera, Braconidae, Fauna, Parasitoids, Biological control, Cotton fields, Iran.

### **Introduction**

Identification of the elements of the insect fauna in cotton fields is the first step for successful establishment of biological control and IPM programs (ROBINSON et al. 1972; XIA 1999). With attention to the efficient role of Braconidae for biological control of several important pests in almost all agroecosystems (SHARKEY 1993; GHAHARI et al. 2006; PAPP 2007), the fauna of these beneficial insects was studied in cotton fields of some regions in Iran. The only work on braconids fauna of Iranian cotton fields is related to GHAHARI et al. (2009) which totally 8 braconid species from 7 genera (*Agathis*, *Bassus*, *Bracon*, *Vipio*, *Spathius*, *Glyptapanteles* and *Elasmosoma*) and 5 subfamilies (Agathidinae, Braconinae, Doryctinae, Microgastrinae, Neoneurinae) were recorded. The objective of this paper is determination and completing the braconids' fauna of Iranian cotton fields in order to conservation of these efficient natural enemies as biological control and IPM programs.

### **Materials and Methods**

In order to faunistic surveys on Braconidae of Iranian cotton fields, firstly all the major regions which included cotton fields were detected. Totally 21 localities of 7 provinces including, Golestan, Mazandaran, Markazi, Tehran, Semnan, Khorasan and Ardabil were sampled. Specimens were collected by sweep netting and malaise traps from different

regions of Iran which contain cotton fields. The materials were killed with ethyl acetate, mounted on triangular labels and were examined with a stereoscopic binocular microscope. Aphid parasitoid samples on various hosts were collected at random from live and mummified aphids on different host plants. Plant samples with aphids containing parasitoids were placed in plastic boxes to obtain adult parasitoids. The emerging parasitoids were transferred with a fine brush into Eppendorf tubes containing 75 % ethyl alcohol. The specimens were mounted on triangular labels and were examined with a stereoscopic binocular microscope. Classification and nomenclature of Braconidae suggested by YU et al. (2006) have been followed. Also for the determination of species, the key and systematic characters and other systematic data used follow those proposed by PAPP (1974, 2005, 2007), QUICKE (1987), BEYARSLAN et al. (2005), BEYARSLAN & FISCHER (1990, 2011), ACHTERBERG (1993) and TOBIAS (1995).

## Results

Totally 44 braconid species from 21 genera and 6 subfamilies were collected and identified from the cotton fields and surrounding grasslands of different regions of Iran. The list of species is given below.

### Subfamily Agathidinae

#### *Agathis montana* SHESTAKOV 1932

Material examined : Golestan province: Nokandeh, 1 ♀, 1 ♂, July 2008.

#### *Agathis fulmeki* FISCHER 1957

Material examined : Golestan province: Minoodasht, 2 ♀ ♀, 1 ♂, April 2007.

#### *Agathis anglica* MARSHALL 1885

Material examined : Mazandaran province: Behshahr, 1 ♀, 2 ♂ ♂, September 2007.  
Golestan province: Ali-Abad, 1 ♂, September 2008.

#### *Agathis nigra* NEES 1814

Material examined : Golestan province: Salikandeh, 1 ♀, April 2009.

#### *Agathis glaucoptera* NEES 1834

Material examined : Mazandaran province: Qaemshahr, 2 ♀ ♀, July 2007.

#### *Agathis umbellatarum* NEES 1814

Material examined : Golestan province: Aghghala, 1 ♀, August 2006.

#### *Agathis malvacearum* LATREILLE 1805

Material examined : Mazandaran province: Behshahr, 2 ♀ ♀, 2 ♂ ♂, September 2007.

***Bassus tumidulus* (NEES 1812)**

M a t e r i a l   e x a m i n e d : Golestan province: Gorgan, 2 ♀ ♀, June 2009.

***Bassus dimidiator* (NEES 1834)**

M a t e r i a l   e x a m i n e d : Tehran province: Varamin, 1 ♂, May 2008.

***Earinus elator* FABRICIUS 1804**

M a t e r i a l   e x a m i n e d : Golestan province: Kordkoy, 1 ♀, August 2006. Golestan province: Nokandeh, 2 ♀ ♀, 1 ♂, July 2008.

**Subfamily A l y s i n a e**

**Tribe A l y s i n i**

***Aspilota delicata* FISCHER 1973**

M a t e r i a l   e x a m i n e d : Ardabil province: Dashte Moghan, 2 ♀ ♀, September 2006.

***Phaenocarpa ruficeps* (NEES 1811)**

M a t e r i a l   e x a m i n e d : Khorasan province: Mashhad, 1 ♀, October 2006.

***Synaldis megastigma* FISCHER 1967**

M a t e r i a l   e x a m i n e d : Golestan province: Minoodasht, 1 ♂, April 2009.

**Tribe D a c n u s i n i**

***Chorebus (Chorebus) affinis* (NEES 1814)**

M a t e r i a l   e x a m i n e d : Khorasan province: Kashmar, 1 ♂, October 2006.

***Chorebus (Stiphrocera) flavipes* (GOUREAU 1851)**

M a t e r i a l   e x a m i n e d : Ardabil province: Dashte Moghan, 1 ♀, September 2006.

***Chorebus (Phaenolexis) leptogaster* (HALIDAY 1839)**

M a t e r i a l   e x a m i n e d : Golestan province: Azadshahr, 1 ♀, October 2008.

**Subfamily A p h i d i i n a e**

***Adialytus salicaphis* (FITCH 1855)**

M a t e r i a l   e x a m i n e d : Golestan province: Gonbad, 2 ♀ ♀, 1 ♂, April 2010.

***Aphidius eadyi* STARY, GONZALEZ & HALL 1980**

M a t e r i a l   e x a m i n e d : East Azarbayjan province: Arasbaran, 1 ♂, September 2008.

***Aphidius uzbekistanicus* LUZHETZKI 1960**

Material examined: East Azarbayjan province: Arasbaran, 2 ♀ ♀, September 2008.

***Binodoxys acalephae* (MARSHALL 1896)**

Material examined: Mazandaran province: Galogah, 1 ♀, 1 ♂, August 2007.

***Ephedrus persicae* FROGGATT 1904**

Material examined: Golestan province: Nokandeh, 2 ♀ ♀, 3 ♂ ♂, July 2008.

***Lysiphlebus confusus* TREMBLAY & EADY 1978**

Material examined: Khorasan province: Kashmar, 1 ♀, October 2006.

**Subfamily Braconinae**

***Bracon (Lucobracon) apricus* SCHMIEDEKNECHT 1897**

Material examined: Semnan province: Garmsar, 1 ♀, June 2007.

***Bracon (Lucobracon) femoralis* BRULLÉ 1832**

Material examined: Mazandaran province: Qaemshahr, 1 ♀, July 2007.

***Bracon (Glabrobracon) popovi* TELENGA 1936**

Material examined: Mazandaran province: Behshahr, 1 ♂, September 2007.

***Habrobracon hebetor* (SAY 1836)**

Material examined: East Azarbayjan province: Arasbaran, 1 ♀, September 2008.

***Bracon (Bracon) intercessor* NEES 1834**

Material examined: Tehran province: Varamin, 2 ♀ ♀, unknown date.

**Subfamily Microgastriinae**

***Apanteles galleriae* WILKINSON 1932**

Material examined: Khorasan province: Mashhad, 1 ♀, 1 ♂, October 2006. Golestan province: Ali-Abad, 1 ♀, September 2008.

***Choeras dorsalis* (SPINOLA 1808)**

Material examined: Ardabil province: Dashte Moghan, 2 ♀ ♀, 2 ♂ ♂, September 2006.

***Cotesia jucunda* (MARSHALL 1885)**

Material examined: Markazi province: Khomein, 2 ♀ ♀, June 2008.

***Cotesia setebis* (NIXON 1974)**

M a t e r i a l   e x a m i n e d : Golestan province: Gorgan, 1 ♀, May 2008.

***Cotesia tetrica* (REINHARD 1880)**

M a t e r i a l   e x a m i n e d : Ardabil province: Dashte Moghan, 1 ♂, September 2006.

***Cotesia tibialis* (CURTIS 1830)**

M a t e r i a l   e x a m i n e d : Golestan province: Kordkoy, 3 ♀ ♀, August 2006. Mazandaran province: Behshahr, 2 ♀ ♀, September 2007.

***Dolichogenidea agilla* (NIXON 1972)**

M a t e r i a l   e x a m i n e d : East Azarbayjan province: Arasbaran, 1 ♂, September 2008.

***Glyptapanteles porthetriae* (MUESEBECK 1927)**

M a t e r i a l   e x a m i n e d : Markazi province: Arak, 1 ♀, June 2008.

***Microplitis ochraceus* SZÉPLIGETI 1896**

M a t e r i a l   e x a m i n e d : Golestan province: Ramian, 1 ♀, unknown date.

**Subfamily O p i i n a e**

***Eurytenes (Jucundopius) campanariae* (FISCHER 1959)**

M a t e r i a l   e x a m i n e d : Semnan province: Garmsar, 1 ♂, June 2007.

***Opius (Agnopius) rex* FISCHER 1958**

M a t e r i a l   e x a m i n e d : Mazandaran province: Galogah, 1 ♀, August 2007.

***Opius (Allotypus) tuberculatus* FISCHER 1959**

M a t e r i a l   e x a m i n e d : Khorasan province: Kashmar, 1 ♀, October 2006.

***Opius (Misophthora) occulius* TELENGA 1950**

M a t e r i a l   e x a m i n e d : Tehran province: Varamin, 1 ♀, May 2008.

***Opius (Opiothorax) latistigma* FISCHER 1960**

M a t e r i a l   e x a m i n e d : Khorasan province: Mashhad, 2 ♀ ♀, October 2006.

***Opius (Opiothorax) magnicauda* FISCHER 1958**

M a t e r i a l   e x a m i n e d : Golestan province: Gorgan, 1 ♀, May 2008.

***Opius (Opiothorax) turcicus* FISCHER 1960**

M a t e r i a l   e x a m i n e d : Markazi province: Arak, 2 ♀ ♀, 1 ♂, June 2008.

***Opius (Phaeditoma) biroi* (FISCHER 1960)**

**Material examined:** Golestan province: Azadshahr, 1 ♀, 1 ♂, October 2008.

**Discussion**

The results of this research which was conducted in some regions of Iran indicate that the fauna of braconid wasps is very diverse in Iranian cotton fields and surrounding grasslands. Therefore, we suggest that these beneficial insects must be supported and conserved by the different methods which decreasing the pesticides' application is the main strategy. Braconids are efficient agents of biological control, which have powerful role in pest control in different agroecosystems (SHARKEY 1993; GODFRAY 1994). Biological control is practiced worldwide in almost every natural and human modified habitat. Because natural enemies are often key factors in the dynamics of pests, biological control should be the cornerstone of IPM (integrated pest management) practices (MAREDA et al. 2003). However, the resources dedicated to the study and implementation of biological control are frequently insufficient (DEBACH & ROSEN 1991), and thus for most crop pest systems, biological control remains an under-utilized option (VAN DRIESCHE & BELLOWES 1996). Because biological control options differ depending on the ecological, agronomic and socioeconomic conditions of the pest situation, it is important to understand the principal practices of biological control to see how they can be applied to any given system. Importation biological control is the purposeful reuniting of natural enemies with their hosts/prey that have become pests in areas outside their original geographic distribution (HUFFAKER & DAHLSTEN 1999; MAREDA et al. 2003).

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**Zusammenfassung**

Die Braconidenwespen (Hymenoptera, Braconidae) zählen zu den wirkungsvollsten Parasitoiden im Kampf gegen landwirtschaftliche Schädlinge aus dem Insektenreich in nahezu allen Agroökosystemen. Die Vielfalt dieser natürlichen Feinde von Schadinsekten wurde in einigen Baumwollfeldern des Iran und ihrem umgebenden Grasland untersucht. Es wurden 44 Arten aus 21 Gattungen und 6 Unterfamilien (Agathidinae, Alysiinae, Aphidiinae, Braconinae, Microgastrinae, Opiinae) gesammelt.

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